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Study of selenate uptake by the higher plant Zea mays susbp. mays (L.): methodology and first results.

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Selenium is known for its dual toxic and essential characters for humans, animals, and some plants. This micronutrient can exist in four oxidation states (selenate (+VI) selenite (+IV) elemental selenium (0) and selenide (-II)) and several organic forms (methylated compounds, selenomainoacids and selenoproteins). The solubility, mobility and bioavailability of these Se species are dependent on pH and redox conditions. Se may be released to the environment by natural processes (mineral weathering) and anthropogenic activities (industrial and agricultural processes like fossil fuel combustion). The transfer of Se from soil through plants is governed by many factors (presence of other ions in soil solution like sulphate, type and age of plants, chemical forms of Se, pH and redox conditions in soil, mycorrhizal and bacterial colonization). That's why higher plants species vary widely in Se uptake and accumulation in roots, stems or leaves and also in tolerance to high Se concentrations in solution or soil. The non-accumulating plants can have a Se concentration in leaves between 2 and 330 mg/kg, respectively for rice and white clover. In the particular case of Se-accumulating plant, the Se concentration can be higher than 4000 mg Se /kg. So, according to the Se critical levels of toxicity (4-5 mg Se /kg feed), the understanding of Se behaviour and accumulation in higher plant is a major stake. The aim of this study is to investigate the influence of Se species, especially of selenate and selenite forms, on the bioavailability and speciation of selenium and its transfer in water-soil- plant systems. Our work

is based on: (1) hydroponic culture of Zea mays susbp. mays (L.) under controlled conditions and monitored environment in climatic chamber with or without selenate pollution (1 mg Se (VI)/L of hydroponic solution), (2) mineralization of plant sample with nitric acid and hydrogen peroxide mixture, analysis of extractable metals (Se, Cu, Fe, Zn, Mn), (3) statistical analysis of monitored and chemical parameters The first part of our work validates the homogeneity of culture conditions and the choice of adequate digestion procedures (reference and replicate samples, growth survey, Leaf Area Index and statistical tests). We can observe different localization and accumulation of analysed elements. Cu, Fe, Mn, Mg and Zn are located in the roots while Ca and Se are clearly stored in leaves of maize (352 μg Se/g dry matter). Moreover, selenium concentrations in leaves are positively related to biomass increase. All data set pointed at a high mobility and availability of selenate specie in higher plant like maize. According to the literature, the preliminary conclusions of these experiments demonstrate that Se concentrations in leaves of maize are very close to Se-accumulating plants level. The short term objectives are now to follow the hydroponic culture of maize with different species selenium (selenite, selenate/selenite) or with different concentration of selenate form.